



Network Basics

What is a network?

A computer network is nothing more than two or more computers connected together in order to share information. It's a simple but very powerful concept. Networked computers (also called nodes, clients, workstations, and servers) perform three key functions; they share files, resources (printers, disks, etc.), and programs.

A networked computer that provides resources is called a server. The computer accessing those resources is called a workstation or client. Servers are usually the most powerful computers on the network because other computers share their resources. Workstations are usually PCs, which are cheaper and less powerful. A computer may be a server or a workstation but rarely both. Keeping this separation greatly simplifies management and administration of the network. Other network components include the network interface card (NIC), which transmits and receives information, and the cabling, which physically connects the computer to the network.

It doesn't take a Ph.D. to understand the advantages of networking. With networking, programs and resources do not have to be replicated across the enterprise. Clients have access to high volumes of information and robust computational power found only in servers. With networks, the whole is truly greater than the sum of the individual parts.

Some applications must be run on networks in order to function properly. A database in a distributed transactional environment is a good example. Each time a transaction occurs, the information is sent to the database. Because the information is updated continuously from multiple workstations (in this case cash registers), the database must reside in one location in order for all parties to have access to and update the same program.

LANs, MANs and WANs

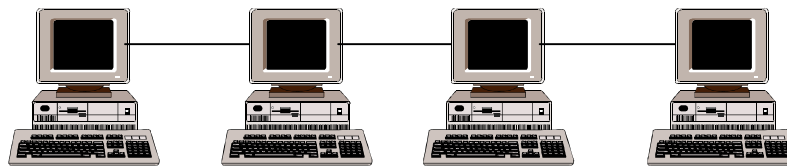
If computers are connected to the network in close proximity to one another, as in the same building or group of buildings, the network is called a local area network (LAN). If the computers are connected over a large metropolitan area it is called a metropolitan area network (MAN). If the network extends over a large geographic area, it is called a wide area network (WAN). WANS are typically connected using long-range telecommunication links and may connect other LANs or MANs together.

Network Topologies

Topology refers to the way a network is wired, arranged, and how devices are connected to the network. In this section we will discuss the three most widely used topologies; Bus, Star, and Token Ring.

Bus

The simplest type of network is the Bus. A Bus connects computers in a row along a single cable segment. An Ethernet network is based on a bus topology.

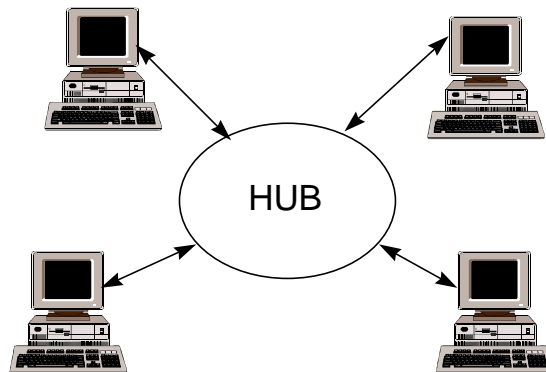


The bus carries data from one end of the network to the other. The data carried across the network has a destination address. Each computer checks the address and, if it matches the computer address, the computer keeps the data. If not, the data is discarded and moves down the bus to the next computer. Local buses require "terminators" at each end to ensure that data is not reflected back across the network. The Bus topology has one major drawback; if the cable (bus) is broken, the network downstream from the break will not be able to communicate with the upstream computers. Without a continuous segment and terminators, the network cannot function properly.

BUS Advantages	BUS Disadvantages
<ul style="list-style-type: none">• Failure of single computer doesn't affect the entire LAN• Easy to connect• Inexpensive	<ul style="list-style-type: none">• Cable break may affect large number of users• Cable length is limited• Difficult to isolate cable errors

Star Topology

In a star topology, computers are connected to a central hub with each computer having its own connection. A hub provides a central connection point so that all computers can communicate across the network.

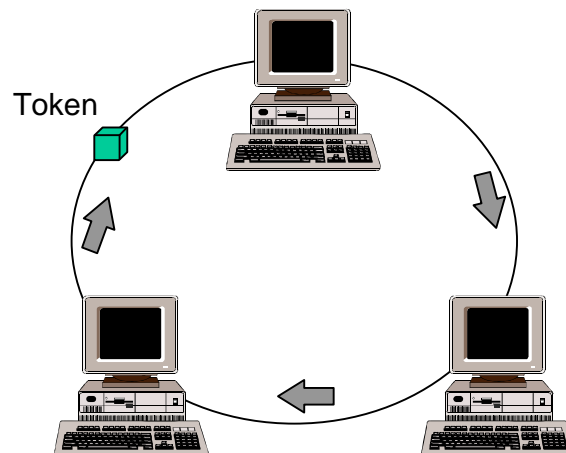


Because each computer has an independent connection, a cable break does not affect the other computers in the network. However, if the hub fails, all computers attached to the hub lose the ability to communicate.

Star Advantages	Star Disadvantages
<ul style="list-style-type: none">• Easy to add workstations• Simplifies network management	<ul style="list-style-type: none">• Hub failure results in loss of communication for all computers attached to hub.

Token Ring Topology

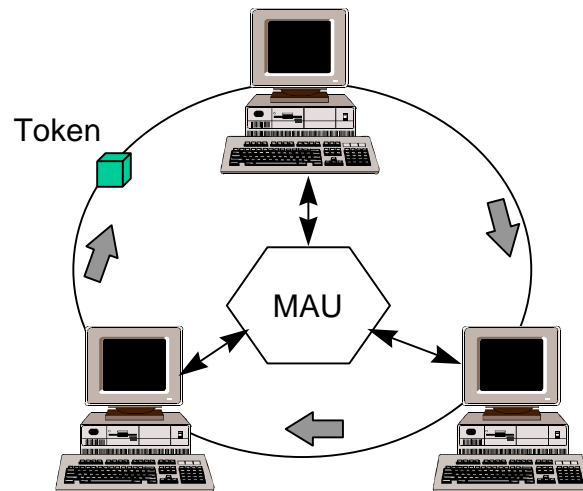
In a token ring topology, computers are connected in a continuous network loop in which a token is passed from one computer to the next. The token is a data frame (or packet) which is continuously passed around the ring.



Each computer must wait for the token to arrive before it can send or receive data. Once a computer has the token, it can add data to the token along with the recipient's and sender's address. When the token is transmitted, it proceeds directly to the recipient's computer without stopping at other workstations along the way. Once the recipient has the data, the token is returned to the originating computer to verify that the data was received. The token is then passed on to the next computer in the ring.

In actuality, Token Ring networks are physically implemented in a star configuration but managed electronically as a ring. Workstations are in fact attached to a hub called a Multistation Access Unit (MAU).

Token Ring Topology with Multistation Access Unit



Token Ring Advantages

- Cable failure affects few users
- Equal access for all users
- Easy to add workstations without large drop in network performance

Token Ring Disadvantages

- Physical connections are more costly

Keys to Remember

- Topology refers to the way a network is wired, arranged and how devices are connected to the network
- The three major network topologies are Bus, Star, and Token Ring
- The purpose of networking is to share resources
- Ethernet is based on a bus topology, which is relatively inexpensive and easy to upgrade
- Star and Token Ring topologies are more expensive to implement, but provide greater fault resilience for workstations